REMARKS

Reconsideration of Applicant's information disclosure statement dated March 27, 2001 is respectfully requested. Contrary to the Examiner's assertion, the IDS did indeed identify each foreign patent by country with publication date. A copy of the papers filed is attached hereto for the Examiner's reconsideration.

Claims 1-3, 8-11, 15, 18-19, 21-27 and 33 have been amended to more particularly point out and distinctly claim the present invention. The claims have not been amended in view of any prior art and the claims are fully supported by the original specification. Claim 20 has been cancelled without prejudice.

Claims 15-17 and 33-35 are rejected under 35 U.S.C. §112, ¶1 for lack of written description. The Examiner alleges that there is no disclosure to the broader limitation of all substrate. Claims 15 and 33 have been amended to claim substrate having a metallic surface. ✓ See page 4, line 25. In addition, claims 19 and 23-35 are rejected under §112, ¶1 for lack of written description. The Examiner alleges that there is no disclosure of the two-layer laminate claimed in claims 19 and 23-35. As noted, claim 19 has been amended to add the limitation of a support film. See page 5, lines 10-19. The amendments made make claims 15-17, 19 and 23-35 ✓ comply with §112, ¶1. The applicants respectfully solicit the Examiner's reconsideration and withdrawal of these rejections.

Claims 1-35 are rejected under 35 U.S.C. §103(a) as being unpatentable over Fifield in view of applicants own disclosure further in view of Hilger and Taguchi '582 and Taguchi

GB'072 and Bennet. For the reasons below, applicants respectfully submit that claims 1-19 and 21-35 are not obvious over cited references.

The Invention

The present invention relates to a photosensitive film which can be laminated by the normal pressure lamination method on the surface of a substrate having a metallic surface in a high product yield, with formation of a reduced number of air voids, and in a high workability. The claimed photosensitive film comprises a support film, a photosensitive resin layer and a protecting film, wherein the photosensitive resin layer has a film thickness of 5-30 μm and wherein the number of fish eyes having a diameter of at least 80 μm included in the protecting film does not exceed 5 fish eyes/m^2. See claims 1 and 19.

The Arguments

The Examiner alleges that the problem to be solved by the instant laminate is to prevent the formation of air voids on the photosensitive layer of a photosensitive film which are caused by fish eyes contained in a protective film, referring to page 2, line 16 to page 3, line 28 of the present specification. However, allegation is not correct, since the Examiner ignores the following important indication as to the prior art (page 3, lines 22-25 of the present specification):

> Formation of the air voids has a relation with film thickness of the photosensitive resin layer so that a smaller film thickness of photosensitive resin layer causes a more ready formation of air voids.

This means that when the photosensitive resin layer is thick, the formation of air voids is reduced and sometimes would not cause a problem.

On the other hand, the thickness of the photosensitive resin layer must be in the range of 5 to 30 μm in the present invention in order to prevent deterioration of follow-up characteristics, defective pattern and breakage of wire, and also to prevent deterioration of resolution (page 12, lines 21-26 of the present specification). Thus, the problem to be solved by the present invention is to reduce generation of air voids while using a **thin** photosensitive resin layer (5-30 μm thick).

The presence of such air voids causes formation of defective pattern and breakage of wire in the subsequent steps of exposure, development and etching as disclosed on page 3, lines 25-28 of the present specification. However, the prior art references do not teach how to reduce the generation of air voids on the substrate while using a thin photosensitive resin layer.

The Examiner ignores the use of the thin photosensitive resin layer while noticing only the presence of fish eyes, resulting in failing to understand the present invention correctly.

As discussed above, the generation of air voids are not solely dependent on the presence of fish eyes. Applicants have conducted tests showing that, even if the protecting film having a large number of fish eyes (ca. 1000) is used, no air voids are generated when the thickness of the photosensitive resin layer is as thick as 40 μm. The relation between the thickness of the photosensitive resin layer and the generation of air voids is detected. The Test Report will be submitted shortly in the form of a formal Declaration.

The present inventors were the first to discover that generation of air voids can be reduced even if a thin photosensitive resin layer is used if the number of fish eyes having a diameter of at least 80 μm included in the protecting film does not exceed 5 fish eyes/m^2.

Claims 1-19 and 21-35 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Fifield in view of applicants own disclosure further in view of Hilger and Taguchi '582 and Taguchi GB'072 and Bennet. This rejection is untenable and should be withdrawn for the following reasons.

1. Fifield (DE 3825782 A)

Fifield discloses a dry film photoresist in the form of a roll of photopolymerizable film (P) laminated between a base film (B) and covering film (C). According to this reference, even if gel and inclusions in the covering film are reduced, there is no disclosure or suggestion of reducing the generation of air voids by limiting the number of fish eyes to the predetermined claimed amount while using a thin photopolymerizable film. The thickness of the disclosed photopolymerizable film is as thick as 38 μm (page 5, line 2 of OS 38 25 782).

As discussed above, the present invention claims a photosensitive film comprising a photosensitive resin layer of a thickness of 5-30 μm and a protecting film having the number of fish eyes having a diameter of at least 80 μm not exceeding 5 fish eyes/m^2. Thus, Fifield does not teach or suggest any of the above limitations of the claims of the present application.

2. Hilger (4,698,292)

Hilger discloses a photopolymerizable recording material comprising a flexible, transparent, dimensionally stable temporary support film, a thermoplastic, transferable, photopolymerizable photoresist layer applied to the support film and a flexible covering film on the other surface of the photoresist layer which adheres less firmly to the photoresist layer than the support film the material being in form of a roll (column 2, lines 39-46). The thickness of the (photopolymerizable) layer is generally in the range of between about 10 and about 100 μm (column 4, lines 52-53).

However, Hilger neither discloses nor suggests reducing the generation of air voids by limiting the number of fish eyes in the protective film, while using a photosensitive resin layer as thin as 5 to 30 μm below the protecting film (or covering film). As discussed above, the applicants have conducted tests showing that, when the thickness of photosensitive resin layer is 40 μm, the air voids generation rate is 0%. The disclosure by Hilger of a photosensitive resin layer of a broad range of 10-100 μm implies that the generation of air voids is irrelevant to the thickness of the resin layer. Thus, Hilger does not teach or suggest that the thickness of a thin resin layer is relevant to the generation of air voids. Furthermore, Hilger does not teach or suggest that the generation of air voids in a thin resin layer can be reduced by using a protecting film having the number of fish eyes having a diameter of at least 80 μm not exceeding 5 fish eyes/m^2.

3. Taguchi (4,360,582)

Taguchi discloses a photopolymerizable element comprising a layer of a photopolymerizable composition and a transparent oriented film support laminated onto one

surface of the photopolymerizable composition layer (claim 1, etc.). As shown in Fig. 4, a protective film 10 can be laminated on another surface of the photopolymerizable composition layer (column 14, lines 57, 60). As indicated by the Examiner, the thickness of the photopolymerizable layer is 0.1 to 1,000 μm, and the most preferable upper limit is an large as 70 μm (column 9, line 17). When the thickness is as large as 70 μm, the problem of generation of air voids does not arise, as shown by the Test Report. However, Taguchi does not disclose or suggest reducing the generation of air voids for the same reasons discussed with respect to the above Hilger reference. When there is no problem of reducing the generation of air voids, the thickness of the photosensitive layer, and the presence of fish eyes in the protective film have no relation to reducing the generation of air voids.

Therefore, inferences made by the Examiner in the Office Action are not technically relevant. Since all of the independent claims are patentable over the reference, the dependent claims are also patentable.

4. Taguchi (GB 2049972)

The contents of this reference are the same as Taguchi (4,360,582), since this application is based on the same Japanese Patent Application Nos. 52-82573 and 52-157091 as in US Patent 4,360,582. Therefore, the above comments apply equally to this reference.

5. Bennet (EP 0,091,693)

Bennet discloses a photosensitive element with a photosensitive composition sandwiched between a flexible support layer and a removable cover sheet (page 1, lines 5-7), whereby the

improvement comprises the cover sheet having a roughened finish on its surface which faces away from the photosensitive composition (page 2, lines 19-22, claim 1). Reasons and advantages of using the roughened finish cover sheet are explained in detail from page 3, line 25 to page 5, line 19, etc., but this reference does not disclose or suggest reducing generation of air voids, as presently claimed. Rather, the cover sheet can have channels for air which allows movement of air into laps when the element is wound in a roll (page 5, lines 26-28). Needless to say, this reference neither discloses, nor suggests reducing the generation of air voids while using a thin photosensitive resin layer under a protecting film having limited number of fish eyes, as presently claimed. This reference does not teach or suggest either the problem of reducing generation of air voids or a solution to this problem. Even for a person skilled in the art, it is impossible to reduce the generation of air voids by using the roughened finish cover sheet taught by Bennet.

Summary

For the reasons above, the references, either alone or in combination simply to not disclose or suggest the claimed features, and therefore do not create a prima facie showing of obviousness.

Conclusion

For all of the above reasons, claims 1-19 and 21-35 are believed to be in condition for

allowance, and prompt notice of allowance is respectfully requested. Questions are welcomed by the below-signed attorney for applicants.

Respectfully submitted,

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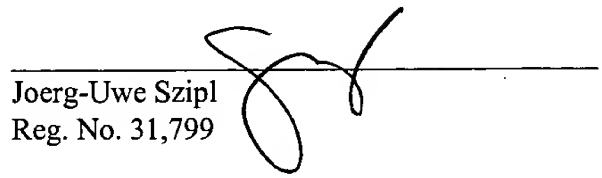

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TEST REPORT

A resolution for forming a photosensitive resin layer was prepared by using Formulation 1 disclosed in Table 1 on page 16 of the specification of the above-identified application.

The solution thus obtained was uniformly coated on a polyethylene terephthalate film having a thickness of 16 μm and dried for 5 minutes in a hot air circulation type oven kept at 100° C. The thickness of the photosensitive resin layer was varied in 5 μm, 10 μm, 20 μm, 30 μm and 40 μm. Then, the following protecting film was laminated thereon to obtain photosensitive films:

NF-13 (polyethylene film mfd. by Tamapoly Co.)
film thickness: 25 μm
number of fish eyes having a diameter of 80 μm or more per m^2 : ca. 1,000

Each photosensitive film was laminated on a substrate while removing the protecting film at a roll temperature of 110° C, under a pressure of 4 kg·f/cm^2, at a speed of 2 m/min. The laminated substrate thus obtained was exposed to light by means of a 3 kW Super-High Pressure Mercury Lamp (HMW-201GX, mfd. by ORC Seisakusho, Ltd.) at 50 mJ/cm^2.

After the exposure, the number of air voids generated on the substrate in the portions of 10 fish eyes having a diameter of 100 μm and the height from the film surface of 6 μm was measured using a microscope with a multiplication of 100.

The relation between the film thickness of the photosensitive resin layer and the generation rate of air voids is shown in the following Table:

Thickness of photosensitive resin layer	5 μm	10 μm	20 μm	30 μm	40 μm
Generation rate of air	100	100	80	20	0

voids (%)					

As shown in the above Table, when the film thickness of the photosensitive resin layer is 5 to 30 μm, air voids are generated. Particularly, when the film thickness of the photosensitive resin layer is 5 to 20 μm, the generation rate of air voids is as large as 80 to 100%. On the other hand, when the film thickness of the photosensitive resin layer is as thick as 40 μm, no air voids were generated, even if the protecting film has fish eyes of about 1000 per m^2.

Marked-Up Version of the Claims to Show Changes Made

2. (amended) A photosensitive film according to Claim 1, wherein the photosensitive resin composition in said photosensitive resin layer (B) comprises:

(a) a binder polymer formed by copolymerizing acrylic acid or methacrylic acid and alkyl esters thereof as constituent monomers[,];

(b) a monomer having at least one polymerizable ethylenically unsaturated group in the molecule thereof[,]; and

(c) a photopolymerization initiator.

3. (amended) A photosensitive film according to Claim 1, wherein the adhesive strength between the photosensitive resin composition-containing photosensitive resin layer (B) and the support film (A) is greater than adhesive strength between the photosensitive resin composition-containing photosensitive resin layer (B) and the protecting film (C).

8. (amended) A photosensitive film according to Claim 2, wherein said binder polymer (a) contains a carboxyl group-containing monomer in an amount of 12 to 40% by weight based on the total amount of the monomers, has a weight-average molecular weight of 20,000 to 300,000, and is used in an amount of 40 to 80 parts by weight[,]; wherein said monomer (b) is used in an amount of 20 to 60 parts by weight; and wherein said photopolymerization initiator (c) is used in an amount of 0.1 to 20 parts by weight, based on 100 parts by weight of the total amounts of (a) and (b).

14. (amended) A photosensitive film according to Claim 2, wherein the monomer (b) is bisphenol A polyoxyalkylene [diacrylate] dimethacrylate, or contains bisphenol A polyoxyalkylene [diacrylate] dimethacrylate as a component.

15. (amended) A process for laminating a photosensitive film on a substrate having a metallic surface, which comprises laminating a photosensitive film of Claim 1 on a substrate, while removing the protective film (C) so as to make the photosensitive resin layer (B) adhere to the substrate.

19. (amended) A photosensitive film comprising a support film, a photosensitive resin layer on said support film, and a film stuck onto said photosensitive resin layer, wherein said film [having] has fish eyes of a diameter of at least 80μm in a number not exceeding 5 per square meter [and being a film which is to be removed at a time of lamination of the photosensitive film on a substrate].

20. (cancelled)

21. (amended) A photosensitive film according to Claim [20] 19, wherein adhesive strength between the photosensitive resin layer and the [further film on the opposite side] support film is greater than adhesive strength between the photosensitive resin layer and the film.

22. (amended) A photosensitive film according to Claim [20] 19, wherein the [further film] support film has a film thickness of 12 to 25μm.

23. (amended) A photosensitive film according to Claim 19, wherein the photosensitive resin layer is made from a resin composition comprising:

(a) a binder polymer formed by copolymerizing acrylic acid or methacrylic acid and alkyl esters thereof as constituent monomers[,];

(b) a monomer having at least one polymerizable ethylenically unsaturated group in the molecule thereof[,]; and

(c) a photopolymerization initiator.

24. (amended) A photosensitive film according to Claim 23, wherein the binder polymer (a) contains a carboxyl group-containing monomer in an amount of 12 to 40% by weight based on the total amount of the monomers, has a weight-average molecular weight of 20,000 to 300,000, and is used in an amount of 40 to 80 parts by weight[,]; wherein the monomer (b) is used in an amount of 20 to 60 parts by weight; and wherein the photopolymerization initiator (c) is used in an amount of 0.1 to 20 parts by weight, based on 100 parts by weight of the total amounts of (a) and (b).

26. (amended) A photosensitive film according to Claim 23, wherein the monomer (b) is bisphenol A polyoxyalkylene [diacrylate] dimethacrylate or contains bisphenol A polyoxyalkylene [diacrylate] dimethacrylate as a component.

33. (amended) A process for laminating a photosensitive film on a substrate, which comprises laminating the photosensitive film of Claim 19 on a substrate, while removing the film so as to make the photosensitive resin layer adhere to the substrate having a metallic surface.